to the succeeding ones, and the induced magnetism after a certain point, proceeds entirely by communication from particle to particle, until the whole power is expended. When, on the contrary, the retentive power of the given substance is small, little or no screening energy exists between its particles, in which case the magnetic excitement will depend upon the influence of the magnet on each individual particle: hence it is only by the succession or multiplication of effect resulting from a great number of particles, that we at length render the controlling power of such a substance sensible. The diminished action of a magnet on a disc of copper, when intersected by radiating grooves, seems to be owing to this cause, since a portion of the substance, requisite to the full development of the magnetic energy, is removed. In confirmation of this reasoning it was found that the number of oscillations of a delicately suspended bar, made in vacuo, in a given arc, surrounded by a mass of copper formed into rings, did not sensibly differ when, in the one case, that mass was made up of concentric rings, and, in the other, was entirely solid: while, on the contrary, by removing a very thin external lamina from the former, the number of vibrations was sensibly changed.

The concluding part of this paper is occupied by speculations on the nature of magnetic action: the author being disposed to regard a magnet as rather in a passive than an active state, when exhibiting the phenomena of magnetic attraction. This attraction he considers as the result of an impression first made on the magnet by the iron which appears to be attracted by it: because he finds that with different masses of iron of the same quality, the force at the same distance is unequal; being with some pieces very sensible, whilst with others it is altogether inappreciable. He views a magnet as a substance put into a peculiar state or condition, in consequence of which it exhibits certain properties when subjected to external excitation; in a way analogous to the elastic force of a spiral spring, which is not called into action unless that spring is stretched by a weight suspended to it, or by some other extraneous force. In the case of magnetism, the exciting substance is likewise affected in a similar manner with the magnet which it excites; and the analogy of the spiral spring may be further pursued, in order to render the two cases corresponding, by supposing the weight which elongates the first spring to be itself another similar spiral spring, which is also elongated while exerting its force on the first. Under these circumstances the separation of the coils will be greatest at the upper end of the whole combination of springs, at least at the lower part, presenting a contrariety of states at the two extremities, analogous to the opposite polarities of the two ends of a magnet.

A paper was read, "On the Atmosphere of Mars." By Sir James South, F.R.S.

The author refers the origin of the hypothesis of the "Extensive Atmosphere of Mars" to the observations of Cassini and Rœner, made at Briare and Paris in the year 1672. By the former it would

seem that a star of the fifth magnitude became invisible with a three-feet telescope when at a distance of six minutes from the planet; whilst by the latter the same star, after having undergone occultation by the planet, could not be perceived with a large telescope till Mars had receded from it a distance equal to two thirds of his own diameter; although with the same instrument stars of similar magnitude might be easily distinguished even when in contact with the moon's limb.

As opposed to these observations, the author advances his own. One, dated Blackman-street, February 19, 1822, in which a star of the ninth magnitude as seen with the five-feet equatorial suffered no diminution of its apparent magnitude, at a distance of 103 seconds from the planet. A second, on the night following, when the star 42 Leonis having been seen within a second of a degree of the planet's limb prior to occultation by the planet, was perceived after emersion, when only one second and one tenth from it; the instruments of observation in this instance were the five-feet equatorial and the thirty-inch Gregorian reflector, the former instrument being used by the author, the latter by Mr. Henry South. The third was made at Campden Hill, on the 17th of March of the present year, with an eight-feet achromatic of six inches aperture; and in this the star 37 Tauri was with a power of 320 seen actually touching the planet's limb.—The star in neither instance suffered more diminution of brightness than might fairly be attributed to the diffused light of the planet.

From these observations, and the apparently contradictory ones of Cassini and of Rœner, the author of this paper infers, that the existence of the extensive atmosphere of Mars is a subject highly meriting further investigation.

He then directs attention to the fact that 37 Tauri was of a red colour when in contact with Mars; whilst 42 Leonis was under similar circumstances of a blue colour: and, from inferences dependent upon observation, states, that the apparent anomaly is easily reconcilable, and that an hypothesis is not wanted to account, on the occasion alluded to, either for the red colour of the one star, or the blue colour of the other.

A paper was read "On the Inflexion of Light." By John Barton, Esq. Communicated by Davies Gilbert, Esq. V.P.R.S.

The design of the author in undertaking the experiments of which he gives an account in the present paper, is to carry on the investigation of the phenomena of the inflexion of light from the point at which it was left by Newton. He begins by examining these phenomena in their simplest form, comparing the appearance of the shadow of an opaque body on a screen of white paper at different distances, with the appearance it would exhibit if the rays passed by the edge of the body, without suffering any deviation from a rectilinear course. It is well known that, under these circumstances, the real shadow is broader than the geometrical shadow, indicating a deflexion of the rays from the edge of the